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ABSTRACT

To discover the relationship between cognitive development and writing, a means of assessing writing is needed that reflects accurately changes in the way children write as they grow older. This may be accomplished by using Piaget's characteristics of concrete and formal operations. His framework permits general descriptions of thinking, organized into four major categories or levels: (1) unconsolidated concrete operational thinking, (2) concrete operational thinking, (3) unconsolidated formal operational thinking, and (4) consolidated formal operational thinking. In the first category children think in images and limit their writing to brief descriptions of physical characteristics, events, or objects, focusing on only one part as if it were all of the image. Students in the second category have increased their knowledge of how the descriptive concepts of the language interrelate with each other. Writing is organized with all of the parts interrelated. The transition to the third category is marked by the beginning of the ability to see that there are alternative ways of describing images. The descriptive material is broken up into groups centering on some theme or issue or more abstract point, but these groups are not related to each other. Thought in the last category is reflected in well organized, coherent work that includes a statement of the problem, a rationale, supporting data, and a conclusion. In fact, the use of this scale on the writing of 100 junior high school students supports the hypothesis that writing characteristics described in this scale are related to level of cognitive development. (HOD)

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Cognitive Development in Writing

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Cognitive Development in Writing

My involvement in trying to understand the relationship between cognitive development and writing came about quite accidentally and as a result of the questions of classroom teachers. For the past 12 years I have been working with a group of junior high school English and Social Studies teachers to group students based on their developmental level. We use a measure of interpersonal development which is related to, but not identical with, the development from concrete to abstract thought as described by Piaget to group students so that we can then differentiate instruction to be consistent with student characteristics. Over the course of the years in which we have been doing this grouping, teachers have had the opportunity to teach all of the levels of students within the grouped arrangement. This led to one of the teachers making the observation that there were systematic differences in the way that students at different levels of development wrote.

That simple observation was a turning point in my thinking. In the first place, it seemed obvious that since cognitive development consists of changes in the nature and organization of thought her observation was to have been expected. In the second place, if the level of cognitive development is indicative of a particular type and organization of thought, then that should place an upper limit on both the content and organization of written work. This would explain some of the frustration experienced by teachers in trying to teach writing skills and, at the same time, give some clues as to how to teach more effectively.

These thoughts led me to try to find a way to investigate whether there was, indeed, a relationship between cognitive development and writing. I ran into an immediate problem. I could find no measure assessing writing which could be theoretically related to cognitive development. That is, people who were assessing writing skills, for the most part, were looking at things about writing which were not developmental in nature. In order to establish the existence of a relationship between cognitive development and writing, a means of assessing writing is needed which accurately reflects changes in the way children write as they grow older which is descriptive of actual writing rather than a judgment about the approximation of children's writing to adult writing.

The closest measure I could find was Hunt's (1965) measure of sentence complexity, the minimum terminable unit (T-unit), which reflects the number of written words per independent clause plus all subordinate clauses. Mean T-unit length has been found to correlate with age (Hunt, 1965; O'Donnell, Griffin, and Norris, 1967; Hunt, 1970), and with measures of formal operations in eighth grade boys, but not girls (Lawson and Shepherd, 1979).

This measure has several limitations, however. In the first place, it is basically a word count. As such, it does not specifically reflect the changes in abstractness and structure presumed to accompany cognitive development in adolescence. Dilworth, Reising and Wolfe (1978) developed a subjective rating of the abstractness of T-units and found that the abstractness rating was more important in teachers' judgement of what distinguished superior from average writing than was the mean T-unit length itself. A second limitation is the failure of the T-unit to be able to assess the composition as a whole.

Dilworth et al. (1978) comment on the interrelations among ideas in superior writing which their subjective ratings assessed. The most important limitation, however, was that the changes reflected in mean T-unit length change did not seem to catch the flavor of the differences that the teachers I was working with were noticing.

Development of the Scale: These considerations indicated that a different assessment technique needed to be developed. Rather than try to look at many student compositions and attempt to develop a writing scale which also might have contained both developmental and non-developmental aspects, I decided to use knowledge of the characteristics of concrete and formal operations as described by Piaget to describe in general terms the changes in the nature and organization of thought. This was not easy because the traditional ways which Piaget used to assess stages of development involved mostly physical and mathematical problems, usually in an oral interview situation, not a written essay nor the content used by the English and Social Studies teachers I was working with.

However, as I pursued the matter I began to see that the thinking underlying the ability to solve Piagetian formal operational problems is the ability to think in general propositions which organize many different observations of the real world independent of their truth. In comparison, concrete operational thinking involves reasoning using systems of concepts which describe physical reality. Understanding this distinction led me to develop general descriptions of thinking organized into four major categories, each of which could be regarded as a level: unconsolidated concrete operational

thinking, concrete operational thinking, unconsolidated formal operational thinking, and consolidated formal operational thinking.

Then, making the assumption that writing is an attempt to express thought and that the nature and organization of thought would place an upper limit on the content and organization of the written work, I constructed hypotheses about how thought would be reflected in writing. I described what I thought writing would look like, at its best, for each level. These descriptions--my writing scale--were compared with actual student writings to see if distinctions among students' writings could be made. This procedure proved to be remarkably effective at providing descriptions of different types of student writing which were very much in accord with types of writing observed by and frustrating teachers.

What I would like to do now is briefly describe the characteristics of levels of thinking that I used to serve as a basis for describing differences in student writing. I will show examples of student work at each level. I can then describe the way we have started to validate the scale and discuss some general thoughts about the relationship between cognitive development and writing skills which have resulted from developing and using this scale.

Unconsolidated Concrete Operational Thought: According to Piaget, children at this level think in images. These images are analogous to photographs in that they are a direct representation of reality, but they include more than visual information such as sensations, emotions or smells. Students use language to describe these images. Their knowledge of the concepts of the language, however, is incomplete, particularly in the sense of how concepts can be interrelated to describe the image as a whole. Hearing or

reading language only, students at this level can reconstruct mental images, but tend to reconstruct parts of images or different images corresponding to parts of the total linguistic sample. This results in some difficulty in constructing wholes which are consistent.

When students who think in this way are asked to write down their thoughts I expected their writing would be limited to descriptions of things which could be "imaged." That is, they would describe physical characteristics, events, or objects. Not only that, but these descriptions should be expected to be brief and simple, focusing on only one part as if it were all of the image. In cases where the assignment demanded it or where the students attended to more than one part of the image, writing was expected to consist of descriptions of parts of the whole in isolation from each other. In this sense, the writing of these students should appear quite disorganized.

These characteristics fit one group of junior high school writers very well. Their writing consisted of physically descriptive sentences with a break between them. In some cases the break was actual in the sense that they started the next sentence on the next line. In others there appeared to be no conceptual relationship between sentences within paragraphs. For example:

Tricycle

Joe and George are on Trikes
it is a black & white picture.
They are trying to bite each other
their going to get married in a month.
They are both playing smash up tricycle. Their is a
girl in the back ground.

Consolidated Concrete Operational Thought: Thinking at this level is still primarily in images. However, students have increased their knowledge

of how the descriptive concepts of the language interrelate with each other. Thus they begin to be able to more accurately differentiate an overall image into its component parts and their interrelationships. They can select a conceptual orientation for describing images and maintain it as a whole while describing the parts. They also can construct an image as a whole from linguistic descriptions which will have differentiated but interrelated parts.

I expected that writing at this level would be as wholes - organized, and with all of the parts interrelated. I expected narratives to be a string of events, one leading to another and, since strings of events have no ending place, it would be common for students to have some manner of indicating the end (the END!). I expected expository writing to be groupings of factual descriptions, disparate, but related in some central way to each other.

In seventh grade these characteristics seem to describe quite a number of written productions! In addition to the fact that these essays tend to be written as one paragraph, testifying, I think, to the fact that the image is being described as a whole, we find other characteristics of writing at this level which are equally distinctive. One is the run-on sentence. Students express the wholeness of their description of the image by not differentiating among the parts! Another characteristic is problems with punctuation which did not appear in earlier writing. It seems as if these students put punctuation into their work because they think it is supposed to be there, but it breaks up the cognitive whole for them, so they use it inaccurately. Here is an example:

Basic Studies

Here I am just sitting looking at the moon. I'm sure glad my day is over! This morning when I left for school, I was walking along and a dog came and ripped my pants. I had to run home and change. When I got to my 1st period class I walked in late and everybody stared at me. While we were singing everybody cutoff the note and I kept singing. everybody laughed at me. Finally I got to Basic Studies class. 2nd period went ok but I got caught with gum and I have to stay after school 15 minutes. 3rd period is a different story. Everytime the teacher tried to talk I would cough or sneeze. Then there was 4th period--Mr. David who was the teacher didn't like me. My friend Jay was telling me his problems and Mr. David made me stay after school an I didn't do anything. 5th period boy that was bad. It was going ok until the last five minutes, then I spilled paint. on me. Oh I was mad. Well 6th period was heavenly absolutely nothing happened. Boy I'm happy.

Unconsolidated Formal Operational Thought: The transition to formal operational thinking is marked by the beginning of the ability to see that there are alternative ways of describing images. This recognition leads to attempts to find out which is the correct alternative and to explore how the alternatives might be interrelated. Students at this level have no internal criteria for making these decisions and, consequently, make considerable numbers of inappropriate choices (which they defend vigorously). Facts or physically descriptive material are interrelated in terms of their relationship to some overriding theme holding across images. Relationships which are not physical or describable in physical terms begin to coordinate thinking.

What I expected to find in writing at this level was more disorganization than at the previous level. The physically descriptive material would be broken up into groups centering around some theme or issue or more abstract

point, but these groups would not be related to each other. They might even be contradictory.

Again, there is a distinguishable set of papers which fit this description. These papers begin to look like adult writing, but they lack coherence. Grammar has improved dramatically. It is as if these students begin to discern the function of punctuation and tense and person agreement. Sometimes it slips between paragraphs, but it is much better than in earlier writing.

Assignment: Write an essay telling whether you think Atticus was right or wrong in defending Tom Robinson and why you think so.

ESSAY

In a way I think he was wrong because he had the right to put his own life in danger but not his childrens. A person can determine what he does with his or her own life, but never make decisions about another persons life. For instance murderers, they shouldn't be able to decide to end someone elses life. They have a fair chance at life so let everyone else have a fair chance also.

Atticus had a lot of pride. He couldn't turn down the case because of danger. Atticus thought of this case as a challenge. He was courageous enough to put lives on the line because he was going to do as much as possible to protect those lives.

I think he could have been putting Calpurnia's life in danger also. Someone could have thought that since Calpurnia and the Finches were so close that if they killed Cal it might make Atticus back away before something happened to his children.

Consolidated Formal Operational Thought: Thought at this level is totally freed from the image. Students can reason about interrelationships among the relationships they discovered earlier. This enables them to understand what information and relationships are relevant to a given point and which are not. Thus, they begin to reason logically, to organize facts to support a point,

and to recognize consistent and contradictory information. They begin to be able to construct an argument from a different point of view from their own.

In terms of writing, I expected that this mode of thinking should be reflected in well organized, coherent work. Essays should state a problem or issue, give a rationale, marshal appropriate data, and draw a conclusion. (Is this the five paragraph essay?) Narratives should have consistently interrelated plot, setting, and characterization.

There are only a few examples of this level of written work in the seventh or eighth grades. Here is one example:

Assignment: Write on "Were the Big Money Men Good or Bad for America?" Prewriting exercise: brainstorming in class and a sample topic sentence provided.

I think that the Men with the big Money were a great asset in the formation of business as we know it today, although they had their shortcomings. Without them, our idea of business would probably be hundreds of companies making hundreds of products--orange juice makers making orange juice, shoelace makers selling shoe laces, and Barbie doll shoe makers selling Barbie doll shoes. I think that a business is most efficiently run when it is run by a mother company that gradually broadens its line of products. The Big Money Men started working with this idea and now many corporations own smaller segments--for instance PepsiCo owns LeeWay Motor Freight, Taco Bell, Lays, Aspen (sport equip.) Wilson sporting goods, Aggressor and Walter Hagen golf clubs, North American Van Lines and many others.

The Big Money Man's original goal in business was to make a quality product. Gradually he started drifting, and his goal slowly inched towards making megabucks. Mass production helped to decrease costs, but quality was harder to ensure. Smaller business men had to charge more for handmade quality work and lost business to the Men with the Big Money.

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Validating the Scale: As can be seen from the examples offered, these characteristics of writing did seem to describe the kinds of work junior high school teachers were getting from their students. To test whether written

work could actually be categorized using these levels, we gave a random sample of approximately 100 students the same narrative writing assignment. I used the four Levels to try to categorize them. In doing so, I found that the global categorization worked quite well, but that I could also distinguish intermediate levels. I then wrote descriptions of these intermediate positions, generally focusing on how the transition from one level to the next might occur. This resulted in a first draft of the total scale that I used to score all of the seventh grade stories (Santmire, 1982).

I calculated the correlation between these scores and scores on the Paragraph Completion Measure, the developmental scale which we were using to determine student groups. This correlation was strikingly high: $r = .61$ ($p < .001$). This suggested to me that the hypothesis on which the scale was constructed, i.e., that the nature and organization of writing are reflective of the level of cognitive development of the writer, was supported.

It also remained to be seen whether or not these criteria were reflective of differences teachers were seeing in writing and whether they could use the scale. We set out to answer these questions by giving both expository and narrative writing assignments to students in the 5th, 7th and 8th grades. I trained the teachers to use the scale and each teacher scored two sets of compositions, their own and those of one other teacher. Thus each composition was scored twice, once by a teacher familiar with the student and once by a teacher who had no knowledge of the student. I also scored the compositions.

Reliabilities ranged from $r = .72$ to $r = .98$ with over half being above $r = .90$. We resolved differences in the scores and calculated the correlation with the scores on the Paragraph Completion Measure. It was as high as before, $r = .62$ ($p < .001$).

There are other aspects of these data which support the hypothesis that the writing characteristics described in this scale are related to level of cognitive development. There were both grade and sex differences in average writing scores. Average writing level increased from grade to grade, and cognitive development was relatively even across both personal-social and cognitive areas in most students. There were some who developed very unevenly, especially at ages of transition. I would like to close by indicating the directions which future work needs to take. Perhaps one of the uses of this writing scale will be to give teachers an indication of where students are, developmentally, within their subject area. This might give some indication of how to organize instruction in the subject area as well as in writing. We need to look at instructional techniques as they impact on performance, using the scale as a measure of how we are doing. We need to look at how the scale works (or fails to work) for students who have non-standard English and/or limited experience in writing thoughts down. We also need to establish connections between this phase of development of writing and earlier and later phases.

Developing and using this scale has helped me and the teachers who have contributed to its development to see student writing in new ways. I hope

that we can use this knowledge and the knowledge we gain in the future to improve instruction in this area.

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